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ABSTRACT

This bulletin provides a discussion of the impact of microcomputer technology and functions as a guide for administrators. It examines issues administrators must address if they are to take an active role in implementing computer programs in their schools. Chapter 2 examines hardware evaluation and selection, giving recommendations on types of computers available on the educational market. Chapter 3, considering the learning environment, details specific precautions and provisions that must be made when incorporating computer equipment into the classroom. Chapter 4 outlines computer courseware--describing resources listing available software--and includes sample evaluation sheets. Chapter 5 discusses computers in the curriculum in three areas of application: computer fundamentals, computer science, and computer-assisted instruction. The final chapter outlines implementation of computer programs in schools, and discusses maintenance of equipment, funding, staff education, and planning. Included are five appendixes of resource listings and lists of reference and interview annotations. (MD)

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David E. Hawley

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January 1984
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Preface

The phenomenal growth in microcomputer technology and its rapid acceptance in businesses and homes are having a major impact on schools. Students and parents are demanding that schools provide them with an understanding of computers and the skills to make intelligent use of them. At the same time, the public is seriously questioning every new school program that requires additional funding.

These factors are causing school administrators to seek answers to some critical questions: How should schools decide which hardware and software to purchase? What do administrators need to know about setting up microcomputers in classrooms and labs? What things should be considered in implementing instructional uses of computing?

This Bulletin examines some of the issues administrators must address if they are to take an active and responsible role in the continuing implementation of computers in their schools. The Bulletin both reflects on that role and provides straightforward advice for making decisions. The Appendices provide comprehensive, up-to-date sources of futher information.

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Philip K. Piele
Executive Secretary

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Introduction

If this were 1478, the business of foundations and government would be to encourage the introduction of the book into the educational system, not to work with monks in monasteries to improve their manuscript production abilities by funding studies on handwriting legibility, the placement of candles for lighting, or the design of better pens or superior ink.

- Dustin Heuston

It is not unreasonable to liken the current impact of microcomputer technology to the invention of the printing press. Gutenberg's 15th century discovery was met with resistance. Despite the fact that one cannot today imagine the world without the printed word, it was not until the end of the 18th century that books were commonly used in schools. The microcomputer today confronts administrators in education with a similar challenge--and an opportunity to respond to that

challenge with confidence.

A great deal has been written in recent years about the coming of the new wave of technology. At the crest of this wave is the electronic digital microcomputer, which, it is said, will be catalytic in radically changing the way in which information is processed.

Yet the electronic computer is not new. It was first developed in 1945 at the University of Pennsylvania as a device that might provide some military advantage. What is new is the size and the price. The rapid growth in technology--from vaccuum tubes, to transistors, to integrated circuits on silicon chips--has progressed to the point where the computing power that was previously required to be housed in a huge, climate-controlled room will now fit easily inside a desk-top computer. Furthermore, in the last five years the cost of computing has dropped sufficiently to enable every segment of society, including the home and the school, to avail itself of the enormous potential of microcomputer technology.

As a result we are facing what might be called a technology push, a phenomenon resulting from the recent overwhelming developments in microcomputer technology. Computer games are flooding the market, and most experts recognize that these entertainment programs are only entry-level attractions for the general public. As consumers are becoming familiar with these simplified computers through entertainment, other more sophisticated microcomputer systems are being purchased. Once these systems and the educational services they make accessible are in place in homes, public education will be either seriously undermined or immensely enhanced. Which consequence will occur is, at this point,

essentially dependent upon the extent to which the educational community is prepared to become involved in dealing with the issues at hand.

Few school administrators are yet really familiar with the major issues surrounding this phenomenon--a phenomenon that may have a greater impact on education than any other they will encounter in their lifetime.

Because of the present economic climate, the public is holding administrators more accountable than ever before for the decisions they make. At the same time, students and parents are clamoring for more use of computers in schools. Chapters 2 through 6 of this Bulletin examine some of the issues school administrators must address if they are to take an active and responsible role in the continuing implementation of computer programs in their schools. The concluding comments in chapter 7 are followed by appendices that list resources to turn to for additional information.

Hardware

Hardware refers to the mechanical and electronic devices that are the physical parts of the computer. A typical microcomputer learning station might consist of a central processing unit (CPU), which stores and processes data and instructions, and a number of peripherals, such as a video monitor, keyboard, and disk or tape drive. A wide variety of other peripherals, such as printers and graphics tablets, are also available.

Choosing a school microcomputer would be relatively easy if it could be easily established that there was one "best" system for school use. But no single brand is best for all applications. For example, a relatively sophisticated computer might be required for high school business education applications, but might be overpowered and costly for an elementary school computer literacy program.

What microcomputers are presently being purchased for use in schools? The Apple Computer Corporation continues to dominate the educational marketplace, following the earlier successes of its Apple II and Apple II+ with the current Apple IIe. While some schools are purchasing lower-priced Commodore Vic 20, Atari, and Radio Shack computers in order to provide hands-on experience for the greatest possible number of students, it appears that the only microcomputer currently making a serious run at the Apple's dominance is the cost-effective Commodore 64. Jack Turner, computer coordinator for the Eugene School District 4J, says that "if money wasn't a problem, we would have all Apples--but it is a problem. We are purchasing Apple

IIe's for use in our high schools. For our elementary schools, we are purchasing Commodore 64's to supplant our Commodore PET's. We're hoping that more software will be available for the Commodore 64 in the near future."

And what of the IBM-PC and the recently unveiled IBM-PC Jr.? Philip Piele, director of the ERIC Clearinghouse on Educational Management and teacher of a course on educational management uses of computers at the University of Oregon, sees the IBM-PC as the "de facto" business computer. He suggests that "the IBM-PC is significantly improved over that used in the earlier 8 bit systems, like that of the Apple." As far as the PC Jr. is concerned, few educators now see it as filling any sort of void in the schools. How well it is accepted will likely depend upon the quantity and quality of educational software developed for it.

One other computer, the Acorn BBC microcomputer--which claims 85 percent of educational sales in Britain--has recently been introduced in the United States. The Acorn is marketed as one part of a "total learning system" that includes educational software supported by educator-designed lesson plans and other print documentation. The Acorn computers, which can be easily "networked" together, will compete in the Apple IIe price range.

It would be ideal if every school administrator could acquire indepth understanding of the nuances of all brands of microcomputer hardware. This is not a realistic goal, however. Most administrators will not have the time, and many will not have the predisposition, to become "experts" in this field. But any decision regarding the purchase

of microcomputer hardware will be crucial in determining the ultimate success of an organization's computer programs, and the school administrator must be sufficiently informed to provide leadership in such a decision. What would seem important, therefore, is that administrators develop an understanding of a process that can be used to make the best possible decisions regarding which microcomputer hardware is best for their schools.

Such a process includes two basic steps: identifying needs, and evaluating how various microcomputer systems might meet those needs.

One way to conduct a needs assessment is to simply identify and list the specific uses to which the microcomputer will be put. An easier way to do this is to use a checklist such as the one provided by Shirley Douglas and Gary Neights in Microcomputer Reference: A Guide to Microcomputers. They provide a comprehensive, three-page checklist that identifies possible educational uses of a microcomputer and assists administrators in developing an awareness of the possible uses in their own schools.

Perhaps the best method for evaluating how various brands of microcomputers meet identified needs is to compare them using an evaluation worksheet like the one included in The Elements of Computer Education, which was prepared by the Montana Task Force on Computer Education (figure 1). The authors list 11 criteria for evaluating a microcomputer system: an importance factor is assigned to each criterion based partly on the previously completed needs assessment. Each computer is then assigned a rating for each criterion. Finally, a total score is calculated for each computer by multiplying each

Hardware Evaluation Worksheet

On the tally sheet below, assign an *importance factor* of 1 to 3 for each category, depending on how important you think each category is to your decision. The factor should be developed by your district committee and should be consistent as you rate various machines. **1 = Not important; 2 = Important; 3 = Very important.**

As you compare machines, give each one a *rating* of 1 to 3 in each category (**1 = Poor; 2 = Average; 3 = Good**). For example, if dealer service is not available, give it a 1 under the "Service" category; if it is good, give it a 3. If the machine is easily moved and compact, the "Flexibility" category may get a 2 or 3. If no software is available, that category may be given a 1.

When all the categories have been rated, multiply them by the importance factor you originally assigned. The end results are then added together. The highest total will indicate the microcomputer best suited for your uses. Be as sincere as possible to get an unbiased evaluation. Color of the case, unnecessary extras, or the salesperson's personality should not affect the choice.

SAMPLE:

Brand X

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost	3	2	6
Service	2	1	2
User Training	1	3	3

Brand _____

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

Total _____

criterion's importance factor and rating, and summing them. This publication also provides excellent guidelines for use in deciding how to rate a microcomputer on each criterion included in the worksheet.

The authors make an interesting concluding comment:

> Be careful about waiting until the "new stuff" comes out. By the time the "new stuff" is out, vendors will be telling you about the "new stuff" coming out. You could go to your grave waiting for the newest "new stuff" to come out. Sometimes there are reasons for waiting. But...use common sense. Computer technology is a very rapidly developing technology--most things have been improved before the next one reaches the market. You can't stay up-to-date because it just happens too fast. "Obsolete" means "no longer practical to use"; your computers will not be obsolete any more than your calculators that are still in use and still provide a valuable service.

A list of resources that provide further information about microcomputer hardware selection is included in Appendix A.

The Learning Environment

To this date educators have generally concentrated on the computer equipment being installed in classrooms and laboratories, with little consideration being given to the environment that supports its use. Whenever computers are placed in learning areas, whether classroom or lab, administrators should consider the following:

(a) Check for glare on monitor screens. If the room has windows, monitors should be placed so that screens are perpendicular to the windows.

(b) Care must be taken to prevent buildup of static electricity, which can affect computer memory and storage. If areas are carpeted (and this is usually acoustically desirable), treatment to reduce static or installation of metal-filament carpet is advised. In very dry climates the relative humidity of the air in the room should be increased through use of an area humidifier.

(c) Computer keyboards should be placed on surfaces four inches lower than those that the students would normally use for writing.

(d) Cords and cables which are generally in great proliferation where microcomputers are used, must be placed in some orderly arrangement. These may be taped to tables and walls or run through plastic or metal conduits. Cable protectors should cover cables that must lay on the floor in exposed areas.

(e) Headphone jacks should be installed where software that makes use of sound is being employed. This will serve to minimize distraction to others in the room.

(f) Each computer station should have ample room for two students, their books, and other supplies.

(g) A flexible vinyl dust cover should be provided for each computer.

(h) Protection should be used to prevent damage to computers during electrical surges.

(i) An uninterruptable power supply should be installed, so that work will not be lost in the event of a power failure.

(j) Consideration should be given to ways in which hardware can be secured against vandalism and theft. While commercial devices are available for locking computers and peripherals to furniture, steel cables and padlocks will suffice.

Where a segregated computer laboratory is set up, further attention needs to be given to providing for an environment that will support the organization of teaching and learning. The most common mode of instruction will be teacher demonstration followed by student investigation. In light of this, consideration should be given to the following:

(a) Students should be oriented in the lab so that they are readily able to be in visual contact with the teaching station (i.e., teacher, overhead projection screen, chalkboard) as well as their own monitor.

(b) Provisions need to be made for students to be able to see a monitor that displays teacher demonstration. This can be ideally accomplished by "networking" the computers in the lab together so that full communication among all stations can take place. The technology to

carry out this kind of networking is very new, however, and where there is not a "resident expert" in the school who can organize and maintain such an innovation, consideration can be given to three other alternatives:

1. A large (23"-26") video monitor may be placed at the teacher's station, facing the students.

2. Several smaller monitors carrying the video signal from the teacher's computer may be placed throughout the room so that each student has reasonable visual access to one of them.

3. A console may be installed at the teacher's station that, by using video signal boosters and switches, would allow the teacher to feed the video signal from the teacher's computer to all student monitors. This solution, like a true network, has the advantage of allowing teachers to cut off the video signal to all student monitors when they want the attention of the class. Regan Carey, who teaches computers in education courses at the University of Oregon, points out that "the very presence of the equipment immediately in front of the students may be a powerful source of distraction during any lecture, discussion, or demonstration session." Because only the video signal would be manipulated by the teacher, the program in the computer's memory at any student station would be unaffected.

(c) Consideration should be given to equipping the teacher's computer station with a telephone outlet and a modem with which to access offsite databases. With this provision, students can be taught to link with powerful sources of information that would otherwise be unavailable to them.

Computer Courseware

Where microcomputers are to be used to provide students with course-related content information, the development, selection, and evaluation of courseware become critical issues.

Courseware refers to the programs (on diskette or tape) and accompanying print documentation that are necessary when using the microcomputer as an instructional tool.

With respect to the local production of courseware, it has been estimated that the production of one hour of quality courseware will take 200 to 500 hours of work. School administrators will not likely find it economically feasible to provide the substantial resource commitment required for this time-consuming activity. Instead, it will be necessary to obtain commercially developed courseware that meets the needs of the instructional program.

The widespread use of personal computers is resulting in an astounding array of courseware of dubious quality, the impact of which could be devastating to school curricula. To counter the rather considerable confusion that this is creating school administrators need to be aware that there is an orderly process by which selection and evaluation of courseware can take place.

The first step in this process is to consider where you want to integrate computers into your curriculum, and write a clear description of what it is you want the courseware to do.

The second step is to find out just what courseware is available to meet your needs. It is not sufficient to rely only on the catalogs that

courseware distributing companies so eagerly provide for your perusal. Each school will need, in addition, copies of several different courseware directories (see Appendix B). One of the most comprehensive of these is The Educational Software Selector (TESS), published by the Educational Products Information Exchange (EPIE), a nonprofit consumer advocacy organization. TESS provides annotated descriptions of the courseware available from over six hundred producers.

A number of offsite computer accessible databases provide listings and reviews of available courseware (see Appendix C). While these can be utilized by individual schools and districts, most access to them will likely be by intermediate and state education agencies that provide database searches for their member districts.

Once you have located a description of a courseware program that might meet your needs, you can proceed to step three--evaluating the courseware. It is usually wise to begin by locating any existing evaluations and reviews that have been done on the courseware in question. Some courseware directories indicate the source of previously published reviews of the programs they list, and a number of periodicals provide regular courseware reviews (see Appendix D). Some of the best periodical-based reviews can be found in The Computing Teacher, published at the University of Oregon by the International Council for Computers in Education (ICCE). The reviews are "written by educators who are specialists in the curriculum area for which the courseware is designed," says Doris Carey, software editor for The Computing Teacher. She also points out that "each review is submitted to the software's author for comment prior to publication. We want our reviews to be

honest and accurate--to look at both the positive and negative sides of the software. Many software producers are very responsive to feedback, and sometimes we even find that a software problem has been corrected during he time we have had it for review."

If the courseware package you are interested in stands up to the critical eye of previous reviewers (or if no previous reviews are available), your school can then do its own evaluation. This means obtaining a preview copy from the manufacturer, distributor, or local sales outlet so that teachers can try it out themselves and with students. EPIE points out that "previewing any courseware you are considering buying is an absolute necessity. And the traditional media-librarian or teacher previewing that has been done over the years for instructional materials simply isn't enough when it comes to microcomputer courseware. Why? Because courseware, unlike traditional materials, is interactive. Students respo.i directly to the courseware; there is no teacher mediation to compensate for poorly designed materials."

Furthermore, the preview should include a structured, written description and evaluation of the courseware. A number of organizations provide forms that can be used for this purpose (see Appendix E). One such form has been developed by MicroSIFT, a major clearinghouse for microcomputer-based educational materials, which was established by the Northwest Regional Educational Laboratory in Portland, Oregon. MicroSIFT (Microcomputer Software and Information for Teachers) publishes both a Courseware Description form and a Courseware Evaluation form. We have included them on the following pages, and permission is

given to reproduce both forms. The forms provide a comprehensive list of "what to look for" in the courseware being previewed and may make administrators aware of some factors that might otherwise be overlooked. MicroSIFT Project Coordinator Don Holznagel points out that the forms are used most effectively in conjunction with the MicroSIFT Evaluator's Guide. This guide, which provides detailed information for use when evaluating courseware, should be in the hands of every school administrator. It can be obtained at a cost of $2.50 from the International Council for Computers in Education, 1787 Agate Street, Eugene, Oregon, 97403.

The final step in the courseware selection and evaluation process is to make a decision, based on the preview, whether or not to purchase the courseware. If you should decide not to purchase, it is appropriate to provide a written explanation to the supplier of the preview copy, with recommendations for improvement of the courseware or alternative uses. If a decision is made to purchase, those who were involved with the preview should make written suggestions for use of the courseware and attach them to the documentation, together with the completed courseware description and evaluation forms.

There is one other emerging courseware issue for administrators to address: illegal copying. Doris Carey points out that "there are teachers who are copying software as they did in the old days when most of it was 'public domain.' They are continuing the practice, in an attempt to build up the best possible library of programs for students to choose from. But most software is now protected by copyright laws, and copying it is essentially theft. A single backup copy may be made

microSIFT COURSEWARE DESCRIPTION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Title _____ Version Evaluated _____

Producer _____ Cost _____

Subject/Topics _____

Grade Level(s) (circle) pre-1 1 2 3 4 5 6 7 8 9 10 11 12 post-secondary

Required Hardware _____

Available for Hard Disk? ☐ Yes ☐ No ☐ Unknown

Required Software _____

Software protected? ☐ Yes ☐ No Medium of Transfer: ☐ Tape Cassette ☐ ROM Cartridge ☐ 5" Flexible Disk ☐ 8" Flexible Disk

Back Up Policy _____

Producer's field test data is available ☐ On Request ☐ With Package ☐ Not Available

INSTRUCTIONAL PURPOSES & TECHNIQUES

(Please check all applicable):

- ☐ Remediation
- ☐ Standard Instruction
- ☐ Enrichment
- ☐ Assessment
- ☐ Instructional Management
- ☐ Authoring
- ☐ Other _____
- ☐ Drill and Practice
- ☐ Tutorial
- ☐ Information Retrieval
- ☐ Game
- ☐ Simulation
- ☐ Problem Solving

DOCUMENTATION AVAILABLE:

Circle P-(Program) or S-(Supplementary Material)

P	S	Suggested grade/ability level(s)	P	S	Teacher's information
P	S	Instructional objectives	P	S	Resource/reference information
P	S	Prerequisite skills or activities	P	S	Student's instructions
P	S	Sample program output	P	S	Student worksheets
P	S	Program operating instructions	P	S	Textbook correlation
P	S	Pre-test	P	S	Follow-up activities
P	S	Post-test	P	S	Other _____

OBJECTIVES: ☐ Stated ☐ Inferred

PREREQUISITES: ☐ Stated ☐ Inferred

Describe package **CONTENT AND STRUCTURE,** including record keeping and reporting functions:

(Use back if additional space needed)

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microSIFT COURSEWARE EVALUATION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Package Title _____ Producer _____

Evaluator Name _____ Organization _____

Date _____ ☐ Check this box if this evaluation is based partly on your observation of student use of this package.

SA-Strongly Agree A-Agree D-Disagree SD-Strongly Disagree NA-Not Applicable

Please include comments on individual items on the reverse page.

CONTENT CHARACTERISTICS

1. SA A D SD NA The content is accurate. (p. 16)
2. SA A D SD NA The content has educational value. (p. 16)
3. SA A D SD NA The content is free of race, ethnic, sex and other stereotypes. (p. 16)

INSTRUCTIONAL CHARACTERISTICS

4. SA A D SD NA The purpose of the package is well defined. (p. 17)
5. SA A D SD NA The package achieves its defined purpose. (p. 17)
6. SA A D SD NA Presentation of content is clear and logical. (p. 17)
7. SA A D SD NA The level of difficulty is appropriate for the target audience. (p. 18)
8. SA A D SD NA Graphics/color/sound are used for appropriate instructional reasons. (p. 18)
9. SA A D SD NA Use of the package is motivational. (p. 19)
10. SA A D SD NA The package effectively stimulates student creativity. (p. 19)
11. SA A D SD NA Feedback on student responses is effectively employed. (p. 20)
12. SA A D SD NA The learner controls the rate and sequence of presentation and review. (p. 20)
13. SA A D SD NA Instruction is integrated with previous student experience. (p. 29)
14. SA A D SD NA Learning can be generalized to an appropriate range of situations. (p. 29)

TECHNICAL CHARACTERISTICS

15. SA A D SD NA The user support materials are comprehensive. (p. 30)
16. SA A D SD NA The user support materials are effective. (p. 31)
17. SA A D SD NA Information displays are effective. (p. 31)
18. SA A D SD NA Intended users can easily and independently operate the program. (p. 32)
19. SA A D SD NA Teachers can easily employ the package. (p. 34)
20. SA A D SD NA The program appropriately uses relevant computer capabilities. (p. 34)
21. SA A D SD NA The program is reliable in normal use. (p. 35)

QUALITY

Write a number from 1 (low) to 5 (high) which represents your judgment of the quality of the package in each division:

_____ Content Characteristics

_____ Instructional Characteristics

_____ Technical Characteristics

RECOMMENDATIONS

☐ I highly recommend this package.

☐ I would use or recommend use of this package with little or no change. (Note suggestions for effective use below.)

☐ I would use or recommend use of this package only if certain changes were made. (Note changes under Weaknesses or Other Comments.)

☐ I would not use or recommend this package. (Note reasons under Weaknesses.)

Describe the potential use of the package in classroom settings:

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(Additional items on back)

Estimate the amount of time a student would need to work with the package in order to achieve the objectives:
(Can be total time, time per day, time range or other indicator.)

Strengths:

Weaknesses:

Other Comments:

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for archival purposes, in case the original is damaged, but in all cases the original should be the one in circulation. Students should never be given the impression that random copying of software is an acceptable practice." How can administrators react responsibly to this issue? "By working with teachers to develop a district policy on software acquisition and copying," says Carey. "The International Council for Computers in Education has developed suggested sample district policies which could be a starting point for considering the issue." ICCE's policies are published in the September 1983 issue of The Computing Teacher.

Computers in the Curriculum

There are three major curricular applications for microcomputers: computer fundamentals, computer science, and computer-assisted instruction.

Computer Fundamentals

Computer literacy has traditionally been the name used to describe a course in which the student acquires a basic understanding of the applications, limitations, potential, and societal effect of computers and computing. Regan Carey suggests that such a body of knowledge might be better named "computer fundamentals" and refer more specifically to the basic computer facts and operations that students should be expected to know, appropriate to their age and grade level. "Appropriate to their age and grade level" are the key words in this concept, for schools will be required to integrate computer facts and operations with other learning experiences if they are to assist students in acquiring computer fundamentals in an orderly fashion.

Until schools are able to expose students to computer fundamentals over a period of several years, a stand-alone course dealing with this content should continue to exist. When it can be ascertained that all students do, indeed, acquire computer information appropriate to their age and grade level on an ongoing basis, then the stand-alone course may be discontinued.

Computer Science

In computer science the computer itself is examined, with students

traditionally being taught advanced programming and operating skills that equip them for jobs available in an economy based on information management. Students attain the highest functional level of understanding of computing when they actually program a computer.

One major issue to be resolved prior to the implementation of computer science programs is the "keyboarding" issue. Students studying computer science will spend a good deal of their time entering information into the microcomputer using a keyboard essentially similar to that of a typewriter. Pecking at a microcomputer keyboard with one finger is akin to pushing an automobile, rather than driving it. In addition, reports Jane Adrian, director of curriculum for the Oregon City School District, teachers of touch typewriting are "already finding students in their classrooms who have acquired, at the computer keyboard, poor keyboarding skills which will be difficult to remediate." While this may be a temporary problem (other methods of putting information into the computer are being refined), school administrators presently need to acknowledge that proper keyboarding skills will be of real value to students who enter computer science courses.

The programming skills students learn in computer science courses are not entirely appropriate for the many high school students who will be users of computers, not programmers. School administrators should consider ways in which students can be offered computer courses that deal with applications (such as word processing) rather than simply learning to program. Both types of courses are necessary options, but students should unquestionably have the opportunity to elect to learn about computer applications without becoming computer programmers. In

addition, administrators will need to ensure that students have access to a program of counselling that will give them accurate information on which they can base decisions regarding the direction of their computer studies.

Computer-Assisted Instruction

In computer-assisted instruction, the computer becomes a teaching and learning tool. Included here may be such usage modes as drill and practice, tutorials, simulation/gaming, inquiry/dialogue, information retrieval, and problem solving.

It is in the area of computer-assisted instruction (CAI) that the discord between proponents and opponents of the use of microcomputers in education becomes most acute. Proponents suggest that CAI succeeds in many instances where traditional educational methods do not. They maintain that the interactive nature of this learning mode makes it an ideal tool for discovery and that the learning process becomes more student-centered and more easily adapted to the individual student's needs. Perhaps most important, they say, is that CAI reduces the time needed for the student to acquire information, thus allowing the teacher and student the opportunity to go beyond the acquisition of facts to the teacher-student interaction that results in real knowledge and wisdom.

Those who oppose the wholesale introduction of CAI still question the effects of exposing young bodies to the alleged health hazards of video display terminals. They suggest, as well, that the probability exists of excessive emphasis on those learning objectives that lend themselves to computerization--the relatively simple knowledge and skill objectives. More complex skills such as analysis and synthesis of

information will, they maintain, be deemphasized. In addition, they express concern that social skills and the development of cognitive reasoning may be ignored. Finally, they maintain that CAI would need to be very cautiously used if it is to meet the needs of those children whose learning modality strength is auditory or kinesthetic, rather than visual.

Those in both camps agree that the usefulness of CAI depends directly on the amount and quality of courseware available and on the extent to which it addresses the needs of a particular curriculum. Further, they concur that if CAI becomes an integral part of pedagogy, school administrators will need to modify the traditional bases for the supervision and evaluation of teaching.

Implementation and Maintenance

The school administrator must address several issues with respect to the implementation and maintenance of computer programs in schools.

The first of these relates to funding. The current economic situation in North America dictates that school boards and the general public be kept particularly well informed about the ways in which computers are used in society. Evening courses for adults and weekend involvement of young children are good ways to begin. Some high schools have provided computer literacy programs for senior citizens, pairing each senior with a student who provides instruction and assistance. A public that is involved with its school's computer programs is more likely to approve expenditures for those programs than one that is not. Creative ways of financing the continuing implementation of computers in the school, such as tapping the private sector, may also need to be explored.

A second issue is that of staff education. David Moursund, director of the International Council for Computers in Education, points out that the greatest barrier to instructional uses of computers is a lack of teacher knowledge about use of computers in education. He suggests that any school district planning to make substantial use of microcomputers in education "must implement a major inservice training program for teachers. This program must be integrated with acquisition of appropriate hardware, software and courseware. It must be a long-term, comprehensive plan, designed to reach the majority of all teachers at all instructional levels." School administrators should

also know that one of the best ways to enhance teachers' knowledge of computers is to give them easy access to the hardware and software. Teachers should be encouraged to take computers home for weekends and holidays, so they can gain experience with them in an environment that is private and nonthreatening.

Finally, the successful maintenance of a program of instructional computing will be largely dependent upon the development of a rather specific plan for that maintenance. Such a plan should include the designation of a well qualified coordinator who can provide a high level of expertise to other faculty members. In the many instances where school administrators are unable to assume that role, they must identify someone who has the expertise and interest, delegate the responsibility, and let that person provide the necessary leadership.

Conclusion

At the beginning of this Bulletin, it was suggested that today's school administrator has an opportunity to respond differently to the advent of a new technology than did those in the past.

The recent startling advances in technology have not yet produced corresponding changes in school curricula and pedagogical approaches. Already, many students are bringing knowledge of computer fundamentals to the school rather than receiving that knowledge from the school. Many parents and educators are becoming increasingly concerned about the emergence of a privileged class of children from homes now equipped with microcomputers. Such an emergence has the potential to create yet another stratification in our society, this one based upon access to information. If public education is to provide the steadying influence in this societal upheaval, schools must act quickly. They cannot risk the danger of being left behind to assume a reactive role.

If, in fact, the use of microcomputers in schools is to be the first quantum leap in learning since the invention of the printing press, educational administrators must acquire the knowledge and skills necessary to provide the kind of leadership that will maximize the positive benefits to the students in their charge.

Appendix A

Sources of Hardware Selection Information

Consumers Union of United States, Inc. Consumer Reports - 1984 Buying Guide Issue. Mount Vernon, N.Y. Consumers Union, 1983.

Douglas, Shirley, and Neights, Gary. Microcomputer Reference: A Guide to Microcomputers. Microcomputers in Education Series. Harrisburg: Pennsylvania State Department of Education, 1980.

Harper, Dennis O., and Stewart, James H. Run: Computer Education. Monterey, California: Brooks/Cole Publishing Company, 1983.

Montana Task Force on Computer Education. The Elements of Computer Education. Helena: Office of Public Instruction, State Capitol, 1983.

Webster, Tony. Webster's Microcomputer Buyer's Guide. Rochelle Park, New Jersey: Hayden Book Company, 1981.

Appendix B

Courseware Directories

The Apple Software Directory, Volume Three: Education
WIDL Video
5245 West Diversey Avenue
Chicago, IL 60639
(Apple educational software, indexed by subject)

Commodore Software Encyclopedia
Commodore Business Machines
Computer System Division
Systems Marketing Group
681 Moore Road
King of Prussia, PA 19406
(Lists Commodore software in a number of categories, including education)

The Educational Software Selector
Educational Products Information Exchange
PO Box 839
Water Mill, NY 11976
(Lists and describes over 6000 educational programs for Apple, TRS-80, Atari, and PET)

Educator's Handbook and Software Directory
Vital Information, Inc.
7899 Mastin Drive
Overland Park, KS 66204
(Lists evaluated educational programs for the Apple)

International Microcomputer Software Directory
Imprint Software
420 South Howes Street
Fort Collins, CO 80521
(Lists microcomputer software, including educational programs)

Marck
280 Linden Avenue
Brandon, CT 06405
(Lists educational programs for Apple, TRS-80, Atari, and PET)

Minnesota Educational Computing Consortium (MECC) Instructional Computing Catalog
2520 Broadway Drive
St. Paul, MN 55113-5199
(Lists educational programs for Apple and Atari)

Queue
5 Chapel Hill Drive
Fairfield, CT 06432
(Lists educational programs for Apple, TRS-80, Atari, and PET)

Radio Shack TRS-80 Educational Software Sourcebook
Available from Radio Shack outlets
(Describes TRS-80 programs in eleven subject areas)

1983 Swift's Directory of Educational Software
Sterling Swift Publishing Company
1600 Fortview Road
Austin, TX 78704

VanLoves Apple II/III Software Directory, Vol. II
Vital Information Inc.
7899 Mastin Drive
Overland Park, KS 66204
(Directory of Apple software, including educational programs)

Appendix C

Computer Accessible Databases

International Software Databases
Accessible through: Dialog Information Retrieval Services
3460 Hillview Avenue
Palo Alto, CA 94304

(Includes descriptions of all types of microcomputer software, with references to reviews)

Resources in Computer Education (RICE)
Accessible through: Bibliographic Retrieval Service (BRS)
1200 Route 7
Latham, NY 12100

(Includes descriptions of educational software, information concerning software producers, a list of research and development projects in computer education, and a file of instructional materials (other than software) to support computer literacy studies)

School Practices Information File (SPIF)
Accessible through: Bibliographic Retrieval Services (BRS)
1200 Route 7
Latham, NY 12100

(Contains descriptions of educational software)

The Educational Software Selector (TESS)
Accessible through: CompuServe
2180 Wilson Road
Columbus, OH 43228

(Contains the EPIE Software File--Goes online February 15, 1984)

Appendix D

Periodicals Containing Courseware Reviews

AEDS Monitor
Association for Educational Data Systems
1201 Sixteenth Street NW
Washington, D.C. 20036

Classroom Computer Learning
Intentional Learning Magazine, Inc.
341 Mt. Auburn Street
Watertown, MA 02172

The Computing Teacher
International Council for Computers in Education
1787 Agate Street
Eugene, OR 97403

C.U.E. Newsletter
PO Box 18457
San Jose, CA 95158

Educational Computer Magazine
PO Box 535
Cupertino, CA 95015

Educational Technology
140 Sylvan Avenue
Englewood Cliffs, NJ 07632

The Electronic Classroom
150 West Carob Street
Compton, CA 90220

Electronic Education
Electronic Communications, Inc.
Suite 220
1311 Executive Center Drive
Talahasee, FL 32301

Electronic Learning
Scholastic, Inc.
902 Sylvan Avenue
PO Box 2001
Englewood Cliffs, NJ 07632

T.H.E. Journal
PO Box 992
Acton, MA 01720

Appendix E

Producers of Software Evaluation Forms

CONDUIT
100 Lindquist Center
The University of Iowa
PO Box 388
Iowa City, IA 52244

Educational Products Information Exchange (EPIE)
PO Box 839
Water Mill, NY 11976

Minnesota Educational Computing Consortium (MECC)
Instructional Systems Development
2520 Broadway Drive
St Paul, MN 55113

MicroSIFT
Northwest Regional Educational Laboratory
300 SW Sixth Avenue
Portland, OR 97204

Scholastic, Inc.
730 Broadway
New York, NY 10003

References

Carey, Regan. "Optional Formats for the Physical Organization of an Educational Microcomputer Lab". Unpublished paper, University of Oregon, 1983.

Consortium for Quality in Educational Computing Products. "Microgram, Volume 1, No. 5." The Computing Teacher, 10, 8 (April 1983), pp. 33-42.

Douglas, Shirley, and Neights, Gary. Microcomputer Reference: A Guide to Microcomputers. Microcomputers in Education Series. Harrisburg: Pennsylvania State Department of Education, 1980.

ERIC Clearinghouse on Educational Management. Administrator's Guide to Computers in the Classroom. Eugene, Oregon: ERIC Clearinghouse on Educational Management, University of Oregon, 1983.

Harper, Dennis O., and Stewart, James H. Run: Computer Education. Monterey, California: Brooks/Cole Publishing Company, 1983.

International Council for Computers in Education. "ICCE Policy Statement on Network and Multiple Machine Software." The Computing Teacher, 11, 2 (September 1983), pp. 18-22.

Lathrop, Ann, and Goodson, Bobby. Courseware in the Classroom. Menlo Park, California: Addison-Wesley Publishing Company, 1983.

Montana Task Force on Computer Education. The Elements of Computer Education. Helena, Montana: Office of Public Instruction, 1983.

Moursund, David. School Administrator's Introduction to Instructional Use of Computers. Eugene, Oregon: International Council for Computers in Education, University of Oregon, 1983.

Northeast Regional Exchange. Evaluation of Educational Software. Chelmsford, Massachusetts: Northeast Regional Exchange, Inc., 1983.

Northwest Regional Educational Laboratory. Evaluator's Guide of Microcomputer-based Instructional Packages. Eugene, Oregon: International Council for Computers in Education, University of Oregon, 1983.

Radin, Stephen, and Greenberg, Harold M. Computer Literacy for School Administrators and Supervisors. Lexington, Massachusetts: Lexington Books, D.C. Heath and Company, 1983.

Interviews

Jane Adrian, director of curriculum, Oregon City School District, Oregon City, Oregon. Interview, November 9, 1983.

Doris Carey, software editor, The Computing Teacher, International Council for Computers in Education, University of Oregon, Eugene, Oregon. Interview, November 4, 1983.

Dexter Fletcher, director, Center for Advanced Technology in Education, University of Oregon, Eugene, Oregon. Interview, November 18, 1983.

Don Holznagel, MicroSIFT, Northwest Regional Educational Laboratory, Portland, Oregon. Telephone interview, November 23, 1983.

Philip Piele, professor, Division of Educational Policy and Management, College of Education, University of Oregon, Eugene, Oregon. Interview, December 2, 1983.

Jack Turner, computer coordinator, Eugene School District 4J, Eugene, Oregon. Interview, November 17, 1983.

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university of oregon
eugene, oregon 97403

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